FOODBORNE DISEASE HANDBOOK

Provided by the Missouri Department of Health and Senior Services
State Public Health Laboratory
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INTRODUCTION

Foodborne diseases cause an estimated 48 million illnesses (roughly 1 in 6 Americans), 128,000 hospitalizations, and 3,000 deaths in the United States each year. Of these, *unknown agents* account for 38.4 million illnesses, 71,878 hospitalizations, and 1,686 deaths. More than 250 different foodborne diseases have been described, most caused by bacteria, viruses, or parasites. The most common causes of foodborne disease are *Campylobacter, Salmonella, E. coli* O157:H7, and Norovirus. Other illnesses are caused by toxins or poisons contained in food. Many of the pathogens that are transmitted through food are also spread through water or from person-to-person or animal-to-person contact (www.cdc.gov/foodborneburden) .

This resource is intended to provide assistance to local public health agencies (LPHAs) in dealing with foodborne illness. The Handbook provides information in an easy to use tabular format that will assist the field investigator in determining what agents to test for, what clinical and food samples are needed, and how to properly collect and submit clinical and food samples to the Missouri State Public Health Laboratory (MSPHL).

When working with outbreaks of foodborne illness, a reasonable effort should be made to determine the probable cause of the outbreak. This will help to ensure that the correct laboratory testing is performed. If a LPHA receives reports of a possible foodborne outbreak, the LPHA staff should contact the Department of Health and Senior Services (DHSS), Bureau of Communicable Disease Control and Prevention (BCDCP) and Bureau of Environmental Health Services (BEHS). BCDCP staff are located in each of the district offices. See link: http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/pdf/BCDCP_district_map.pdf
BCDCP staff will assist the LPHA in investigating the outbreak, including the development of a case definition and questionnaires, a determination of probable agents and suspect foods, and coordination of sample collection and submission to the MSPHL. Additional DHSS staff from the Section for Communicable Disease Prevention and Control and the Section for Environmental Public Health, including district Environmental Public Specialists, may be dispatched to the location of the outbreaks to assist in the investigation.

It is important to remember that each type of agent (bacterial, viral, parasitic, or chemical) has its own collection and transport conditions. Bacteria cannot be isolated from samples collected for parasites and parasite examination cannot be performed on samples submitted for bacteria. Likewise, viral testing cannot be performed on samples submitted for bacteria or parasites. However, requests for isolation of more than one organism from a single clinical sample can be made if transport conditions (transport media, temperature, etc.) are the same. Kits for specimen submission are available at the MSPHL, free of charge, and be obtained by calling (573) 751-4830 or ordered from the MSPHL web site at http://health.mo.gov/lab/pdf/OrderForm.pdf. Detailed directions on specimen collection and transport can be found in the Communicable Disease Investigation Reference Manual (CDIRM), available online at http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/index.php, and on the MSPHL website at www.health.mo.gov/Lab.

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Disease By Onset		
Upper gastrointestinal tract symptoms (nausea, vomiting) occur first or predominate:		
Onset (time to symptoms):	**Predominant symptoms:**	**Organism to suspect:**
1-6 hours (usually 2-4 hours)	Nausea, vomiting, abdominal cramps, diarrhea	*Bacillus cereus* (emetic toxin-producing) *Staphylococcus aureus*
10-72 hours (usually 24-48 hours)	Nausea, vomiting, abdominal cramps, diarrhea (vomiting may predominate in children; diarrhea may predominate in adults)	Noroviruses
24-72 hours (usually 48 hours)	Nausea, vomiting, fever, abdominal pain, watery diarrhea	Rotaviruses
2-30 days (usually 7 days)	Nausea, abdominal pain and cramps, vomiting common in children, diarrhea common in adults (may be profuse and watery), fever	*Cryptosporidium parvum*
Lower gastrointestinal tract symptoms (abdominal cramps, diarrhea) occur first or predominate:		
Onset (time to symptoms):	**Predominant symptoms:**	**Organism to suspect:**
6-24 hours (usually 6-12 hours)	Abdominal cramps, diarrhea, sometimes nausea and vomiting	*Bacillus cereus* (diarrheal toxin-producing) *Clostridium perfringens*
10-72 hours (usually 24-48 hours)	Abdominal cramps, diarrhea, nausea, vomiting, (vomiting may predominate in children; diarrhea may predominate in adults)	Noroviruses
12-72 hours	Abdominal cramps, diarrhea (may be bloody or mucoid), fever, chills, malaise, headache	*Salmonella* species *Shigella* species Pathogenic *E. coli* *Vibrio* species *Yersinia* species *Campylobacter* species Rarely *Aeromonas* or *Plesiomonas* species
3 days-6 weeks (usually 7-10 days)	Chronic diarrhea (loose, fatty stools), abdominal pain, gas, fatigue, weight loss	*Giardia lamblia*

Lower gastrointestinal tract symptoms (abdominal cramps, diarrhea) occur first or predominate (continued):		
Onset (time to symptoms):	**Predominant symptoms:**	**Organism to suspect:**
3 days-several months (usually 2-4 weeks)	Abdominal pain, diarrhea (may be bloody), headache, drowsiness, constipation may alternate with diarrhea	*Entamoeba histolytica*
2-30 days (usually 7 days)	Diarrhea in adults (may be profuse, watery), nausea and vomiting in children, abdominal pain, cramping, fever	*Cryptosporidium parvum*
1-11 days (usually 7 days)	Protracted, often relapsing diarrhea (may last up to 7 weeks), fatigue, cramping, weight loss, anorexia	*Cyclospora cayetanensis*
3-10 days	Diarrhea (usually more than a week), respiratory symptoms	Adenoviruses (types 40 and 41)

Sample Collection Media/Kit

Cary Blair Media for Clinical Bacterial Testing

Empty Specimen Cup for Viral Testing

Parasite Testing Media for Parasite Testing

Food Sample Collection Kit for Bacteria and Chemical Testing

Submitting Clinical specimens for Bacterial Testing

IMPORTANT: Testing for the agents *Clostridium perfringens**, *Bacillus cereus** and *Staphylococcus aureus** is offered only during outbreak situations. Also, testing for these organisms is not routinely performed at the Missouri State Public Health Laboratory and prior authorization MUST be obtained before submitting samples for these agents. A minimum of three stools from symptomatic individuals is recommended. It is also important to note that when requesting a test for *C. perfringens, B. cereus, or S. aureus*, clinical specimens will not be tested without concurrent submission of suspected food(s).

Organism suspected:	Proper specimen:	Transport conditions:
*Bacillus cereus**	Stool	Cold, **NO** transport media
	Vomitus	Cold, **NO** transport media
Campylobacter	Stool	Cold, **Cary-Blair** transport media
*Clostridium perfringens**	Stool	Cold, **NO** transport media
E. coli (pathogenic)	Stool	Cold, **Cary-Blair** transport media
Salmonella	Stool	Cold, **Cary-Blair** transport media
Shigella	Stool	Cold, **Cary-Blair** transport media
*Staphylococcus aureus**	Stool	Cold, **Cary-Blair** transport media
	Vomitus	Cold, **NO** transport media
Vibrio	Stool	Cold, **Cary-Blair** transport media
Yersinia	Stool	Cold, **Cary-Blair** transport media

Collect stools during active diarrhea, as soon as possible after onset of symptoms and before antibiotic treatment.

Food Sample Collection and Submission

IMPORTANT: Consumer complaint samples from the general public are not accepted at the MSPHL. Consumers are advised to take the product to the manufacturer or store where it was purchased. Illness resulting from food consumption should be reported to your local county health department. Suspected food tampering cases should be reported to your local law enforcement agency.

Food samples are accepted for testing under the following conditions:

1. **Foodborne disease outbreak investigation** – Investigation must be coordinated by either the Section for Communicable Disease Prevention and Control or the Section for Environmental Public Health. Samples are collected and submitted by an official of the local public health agency or state district health office. Sample collection and submission must be coordinated through the District's Epidemiology Specialist. Whenever possible, samples should be non-compromised, unopened containers that are properly transported and submitted with complete documentation. If the food is not in an unopened container, the sample should be representative of the product in question, collected in an aseptic method and submitted with complete documentation. Clinical samples from the affected consumers should be available for testing, but are not required. LPHA and BCDCP officials must consult with the MSPHL prior to submitting samples.

2. **In support of surveillance or an enforcement action resulting from a sanitary inspection performed by a local or state public health official** – Samples are collected and submitted by an official of the local public health agency or state district health office. Samples should be non-compromised, unopened containers that are properly transported and submitted with complete documentation. Only sanitation standards testing will be performed (aerobic late count, coliform count, yeast and mold). LPHA and DHSS officials must consult with the MSPHL prior to submitting samples.

3. **In support of food safety surveillance programs administered by state or federal agencies** – Samples are collected and submitted according to pre-determined schedules by an official of the local, state or federal public health agency.

4. **In support of federal or state investigations of suspected terrorism events** – Federal or state law enforcement agency declares event is a possible act of terrorism. Samples are collected and submitted by federal or state law enforcement officials, or their designee.

General information:

- Foods should be shipped cold. Frozen foods should be shipped on dry ice so they remain frozen during transport

- Food sample collection and shipping kits are available from the MSPHL, and are also located at each District DHSS Office and various LPHA's. Contact the MSPHL for the location of the nearest food sample kit.

- Suspected foods must be transported to the laboratory in the most expedient manner. The MSPHL state-wide courier system operates Monday through Friday, with stops at most LPHA's. Samples are delivered overnight to the MSPHL. A list of MSPHL courier pickup sites and times may be found at: http://health.mo.gov/lab/courierservices/pdf/courierlocationsbycounty.pdf

- A complete food sample information form must accompany each sample submitted. A sample form is included at the back of this booklet and can be found at: http://health.mo.gov/lab/envbact/pdf/FoodSpecimen.pdf

- Specific directions for collection and transport of specimens are listed in the Communicable Disease Reference Manual (CDRF), Foodborne Section. http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/index.php

Submitting Specimens for Viral Testing

Testing for noroviruses* is offered only during outbreak situations. Routine diagnostic testing is not performed. Please submit 3-10 samples, collected from different patients, for each outbreak that is being investigated. Viral surveillance testing requires multiple positive samples from each outbreak for sequence analysis. This sequence information allows the linking of cases to each other and to a common source, the rapid assessment of the relationship between viral strains and the identification of new viral strains.

http://health.mo.gov/lab/virology/pdf/NorovirusInstructions.pdf

Organism suspected:	Proper specimen:	Transport conditions:
Adenovirus	Stool	Cold, **NO** transport media
Noroviruses*	Stool	Cold, **NO** transport media
	Vomitus	Cold, **NO** transport media
Rotavirus	Stool	Cold, **NO** transport media

Collect stools (unmixed with urine) and vomitus during the acute phase of illness (within 48 to 72 hours after onset of symptoms), though stool samples can remain positive for as long as 5 days after symptom onset.

Submitting Specimens for Parasitic Testing

Organism suspected:	Proper specimen:	Transport conditions:
Cryptosporidium	Stool	Room temperature; **PVA** and **Formalin preservatives**
Cyclospora	Stool	Room temperature; **PVA** and **Formalin preservatives**
Giardia	Stool	Room temperature; **PVA** and **Formalin preservatives**

Collect stools any time after onset of symptoms, but preferable as soon as possible after onset.

Submitting Specimens for Chemistry Testing

All food/beverage samples must be initiated and submitted with approval from the MSPHL and the DHSS BEHS.

Specimen collection supplies must be obtained from the MSPHL after approval for collection has been granted.

Food Samples must have at least 25 grams of food material collected in a suitable container for the Poisons in Food/Beverages Screen.

Beverage samples must have at least 50 milliliters of beverage collected in a suitable container for the Poisons in Food/Beverages Screen.

Food/Beverage minimum sample collection amounts for radiological analysis are density dependent; more information can be obtained by contacting the MSPHL.

Shipping and collection procedures and forms are available by contacting the MSPHL.

Food/Agents Commonly Associated with Foodborne Illness

Suspected Food Vehicle:	Consider testing for:
Beef and beef products	*Salmonella* species *Clostridium perfringens* *Staphylococcus aureus* *Campylobacter* species *E. coli* O157:H7
Canned foods (especially home-canned)	*Clostridium botulinum* toxin (Botulism)
Cereals or foods containing cornstarch	*Bacillus cereus*
Cheese	*Staphylococcus aureus* *Salmonella* species Pathogenic *E. coli*
Soft Cheese	*Staphylococcus aureus* *Salmonella* species Pathogenic *E. coli* *Listeria* species
Chick peas, garbanzo beans	*Clostridium perfringens* *Bacillus cereus*
Confectionery products	*Salmonella* species *Staphylococcus aureus*
Corned beef	*Salmonella* species *Staphylococcus aureus*
Cream-filled baked goods, custards	*Salmonella* species *Staphylococcus aureus* *Bacillus cereus*
Egg and egg products	*Salmonella* species
Fermented meats	*Staphylococcus aureus*

Food/Agents Commonly Associated with Foodborne Illness

Suspected Food Vehicle:	Consider testing for:
Fish	*Vibrio* species *Aeromonas* species *Plesiomonas* species Fish parasites
Fruits (raw), Unpasteurized fruit drinks	*Shigella* species *Cyclospora* species *Cryptosporidium* species Pathogenic *E. coli*
Ham	*Staphylococcus aureus*
Hamburger	*E. coli* O157:H7 *Salmonella* species
Mayonnaise	*E. coli* O157:H7 *Salmonella* species
Melon	*Salmonella* species Pathogenic *E. coli* *Shigella* species
Mexican foods	*Clostridium perfringens* *Bacillus cereus* *Salmonella* species *Shigella* species *Staphylococcus aureus*
Milk (unpasteurized)	*E. coli* O157:H7 *Salmonella* species *Campylobacter* species *Listeria* species *Yersinia enterocolitica* *Staphylococcus aureus*
Milk (dry)	*Salmonella* species *Staphylococcus aureus*
Oriental foods	*Bacillus cereus* *Vibrio* species

Food/Agents Commonly Associated with Foodborne Illness

Suspected Food Vehicle:	Consider testing for:
Pasta or foods containing pasta	*Bacillus cereus* *Staphylococcus aureus* Pathogenic *E. coli*
Pork	*Salmonella* species *Campylobacter* species *Staphylococcus aureus* *Clostridium perfringens* *Yersinia* species Intestinal parasites
Potato	*Bacillus cereus* *Clostridium botulinum* toxin
Poultry or foods containing poultry	*Salmonella* species *Campylobacter* species *Staphylococcus aureus* *Clostridium perfringens* *Yersinia* species
Improperly washed vegetables (lettuce), herbs (basil, parsley), berries	*Shigella* species Pathogenic *E. coli* *Cyclospora* species
Rice	*Bacillus cereus*
Salads (also may contain poultry, egg, meats or fish)	*Salmonella* species *Shigella* species *Staphylococcus aureus* Pathogenic *E. coli* Noroviruses
Shellfish	*Vibrio* species *Aeromonas* species *Plesiomonas* species
Smoked meats, poultry or fish products	*Salmonella* species *Staphylococcus aureus* *Clostridium botulinum* toxin
Soups, stews, chowders, gumbos	*Bacillus cereus* *Clostridium perfringens*

Resources and References

For more information on foodborne illness, submitting samples or to order specimen submission kits, contact the Missouri State Public Health Laboratory at **(573) 751-3334**, during working hours.

For after-hours assistance, the Missouri Department of Health and Senior Services Hotline number is available 24/7: **1-800-392-0272**.

Information on sample collection/submission and testing methods is also available on the State Public Health Laboratory website at:
www.health.mo.gov/Lab/index.html

To e-mail a general question to the Missouri State Public Health Laboratory:
LabWeb1@health.mo.gov

CDC's Division of Foodborne, Waterborne, and Environmental Diseases (DFWED) can be accessed online at**:**
http://www.cdc.gov/ncezid/dfwed/index.html

Communicable Disease Investigation Reference Manual, is available at:
http://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/cdmanual/index.php

CDC Estimates of Foodborne Illness in the United States, February 2011, CDC, National Center for Emerging and Zoonotic Infectious Diseases, www.cdc.gov/foodborneburden

MISSOURI DEPARTMENT OF HEALTH AND SENIOR SERVICES

Food Specimen Information Sheet

State Public Health Laboratory

A form must be completed for each sample submitted. Failure to complete and submit form may delay testing.

SAMPLE COLLECTED BY / SUBMITTED BY (NAME)	DATE COLLECTED: TIME COLLECTED:
AGENCY	☐ OFFICIAL ☐ UNOFFICIAL ☐ SEALED ☐ UNSEALED
AGENCY ADDRESS (STREET NUMBER & NAME)	ORIGINAL CONTAINER ☐ YES ☐ NO SAMPLE CONTAINER STERILE? ☐YES ☐ NO
AGENCY CITY, STATE, ZIP CODE	FOR LABORATORY USE
DESCRIPTION OF SAMPLE	LAB NUMBER / DATE RECEIVED
PLACE & ADDRESS WHERE SAMPLE WAS OBTAINED	CONDITION OF SAMPLE ON ARRIVAL ☐ SATISFACTORY ☐ FROZEN NOT ☐ UNSATISFACTORY ☐ ICED ☐ ICED
NAME OF PRODUCER:	LAB COMMENTS
PRODUCER'S ADDRESS:	

MFG. LOT #	EXPIRATION DATE	☐ PERISHABLE ☐ NONPERISHABLE	SIZE & TYPE OF CONTAINER

APPEARANCE OF CONTAINER (SWELL, NORMAL, ETC.)

REASON FOR ANALYSIS

☐ SURVEILLANCE ☐ CONSUMER COMPLAINT ☐ SUSPECTED FOODBORNE ILLNESS
☐ COMPLIANCE ☐ FDA CONTRACT

REMARKS →

SPECIFY THE TESTS YOU ARE REQUESTING (Phone the SPHL for assistance)

Transport samples to the State Public Health Laboratory as quickly as possible. The SPHL courier system for overnight delivery is the recommended method. Contact the SPHL Environmental Bacteriology Unit prior to submitting samples. Submit samples to:

DHSS State Public Health Laboratory
Environmental Bacteriology Unit
101 North Chestnut Street, P.O. Box 570
Jefferson City, MO 65101

Phone: 573-751-3334
Fax: 573-522-4032

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